UNITED STATES DEPARTMENT OF AGRICULTURE
MISCELLANEOUS PUBLICATION No. 206

WASHINGTON, D.C. AUGUST 1934

# THE NAVAL STORES STATION OF THE BUREAU OF CHEMISTRY AND SOILS

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## INTRODUCTION

Funds were granted the Bureau of Chemistry and Soils of the United States Department of Agriculture on July 1, 1931, for the establishment of a naval stores station. After study of available locations and consultations with representatives of naval stores interests, a committee representing the Department of Agriculture selected a site on the western edge of the Osceola National Forest, about 12 miles east of Lake City, Fla. This site was selected primarily because the naval stores field work being conducted by the Forest Service and the Bureau of Chemistry and Soils could best be coordinated here and because the turpentine gum necessary for the work of the experiment station is available from the Osceola National Forest. The site fronts immediately on the Old Spanish Trail, a concrete road, and is accessible from all parts of the turpentine belt by rail, bus, or private automobile.

Ground was broken on September 9, 1931, and the fire still and other installations were put in operation on September 18, 1932.

The head office is located in the Post Office Building at Lake City. Mail, telegrams, and telephone messages should be addressed to the Naval Stores Station, Bureau of Chemistry and Soils, Post Office Building, Lake City, Fla. Express shipments may be addressed to Lake City or to Olustee, Fla. Freight shipments should be addressed to Olustee.

## BUILDINGS AND EQUIPMENT

The station, which extends over a 10-acre tract enclosed by a 6-foot wire fence, now has a general industrial laboratory (fig. 1), 40 by

100 feet and 20 feet to the eaves, in which are installed steam stills of various types, condensers of different designs, gum-cleaning equipment, naval stores equipment used in France, and chemical laboratory and other equipment necessary for studying problems in the use of turpentine and rosin. The equipment is used to show producers how to meet the requirements of the several industries using their products and will be modified and different equipment designed, built, and tried as the work necessitates. Investigations on gum cleaning will be conducted in this laboratory, and better processes and products better adapted to particular uses will be developed.

There is also a boiler house, 30 by 36 feet, in which are installed a 100-horsepower boiler and a 25-horsepower boiler, together with pumps, air compressors, and the like.

A model fire-still building and still setting, recommended by the Bureau of Chemistry and Soils and designed as an example of the best type of general fire-still installation for the industry so far

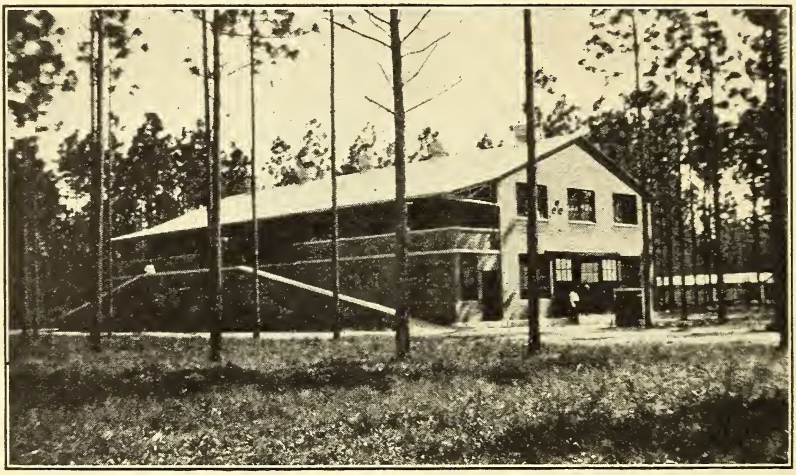

FIGURE 1.—Front and west end of main laboratory.

known, with the modifications and additions necessary for the experimental work to be conducted, is one of the most important buildings at the station (figs. 2, 3, and 4).

The other buildings and equipment include a complete water-supply system, temporary office, garage, truck scales (fig. 5), cooper shed (fig. 6), lighting plant, rosin shed, turpentine shed, turpentine storage tanks (fig. 7), and a complete fire-protection system with water accessible at all points on the station grounds. There are also two residences for employees so that the station may have the protection of responsible personnel at all times.

All the buildings have been built with the thought of permanence in mind. They are of such material and construction that they will be serviceable for many years and will not need rebuilding or extensive repairs.

## PURPOSE OF THE STATION

There is nothing new about the experiment station idea; it has amply proved its value, even its necessity in agriculture. First de-

veloped for the better and more economical production of cultivated crops, the experiment station has been found a sound and effective means of progress in agriculture during almost 100 years of trial in

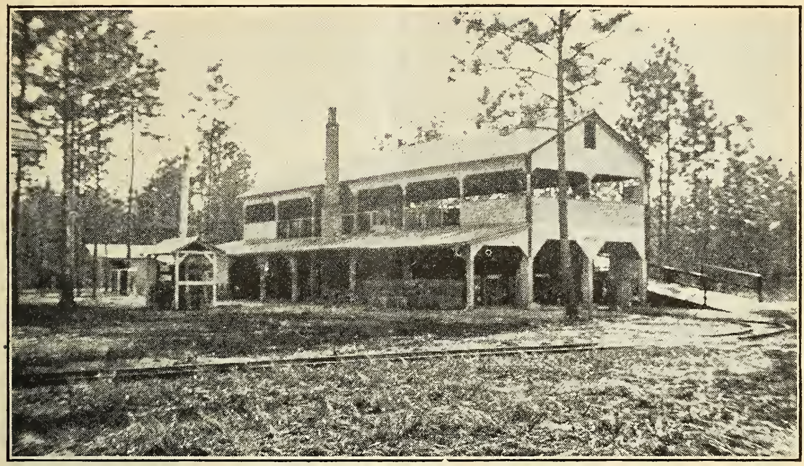

FIGURE 2.—General view of fire still from the north. Still fuel is kept under cover in the fuel rack to the left of the building. Note spark arrester on chimney.

the United States and in Europe, so that now, all over the world, experiment stations are devoted to specific purposes, such, for instance, as the production of sugarcane, beets, and sugar; the development of dairy cattle and the improvement of dairy products; the

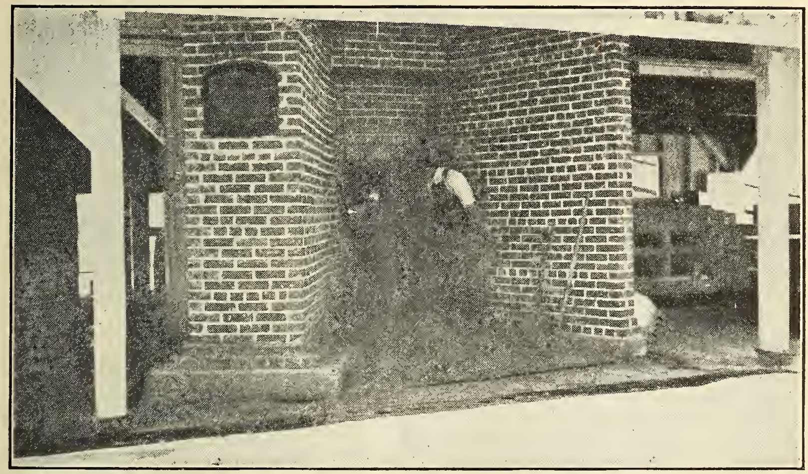

FIGURE 3.—The furnace of the fire still. This type construction carries the minimum insurance charges.

production and utilization of citrus and other fruits; the production and improvement of cotton; and the study of many forestry problems of production and use. A station of the United States Forest Service that specializes in the study of forestry problems of

the pine tree as related to naval stores production adjoins this station.

The need for a naval stores station has been felt by the naval stores people for years, and it is the producers, individually and col-

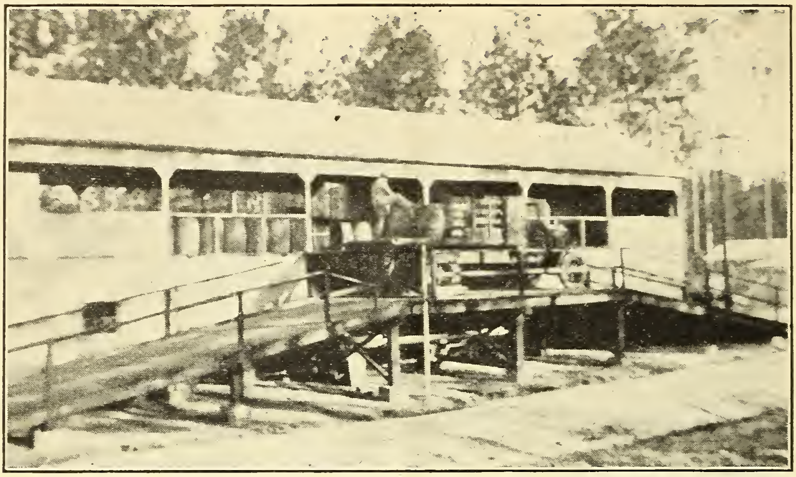

FIGURE 4.—Gum delivered at the fire still is easily and quickly unloaded. The gum platform is part of the charging deck, and the gum is always under cover.

lectively, through their organization, the Pine Institute of America, that have made possible the opening of this station, the first of its kind to be established in the United States. The establishment of

FIGURE 5.—Truck scales and scale house, with garage and tool house in background. All incoming gum and outgoing products are weighed, and an accurate accounting of them is kept.

this naval stores station marks a distinct step forward for our naval stores producers. Had it been opened 10 years sooner the naval stores industry probably would have had an easier time in recent years.

The purpose of this station is to work out on a practical operating basis each and every problem encountered in the production and use of naval stores, from the cup to their utilization in making paint

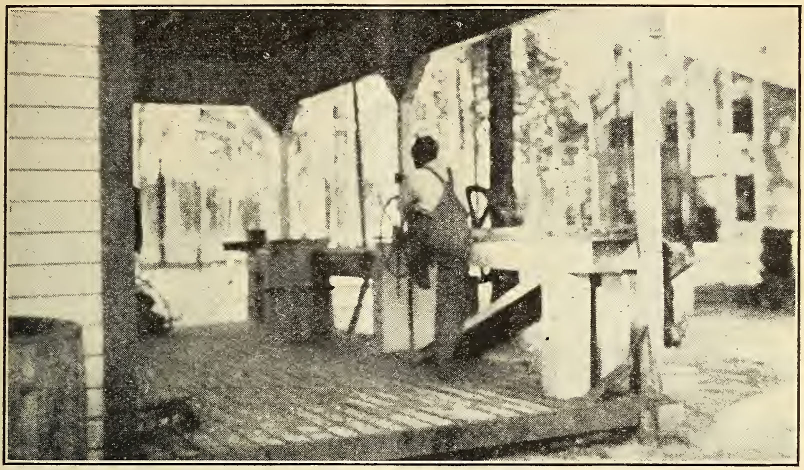

FIGURE 6.—At the model cooper shed only well-made rosin barrels are put up.

and varnish, soap, paper, size, rosin oils, shoe polish and other polishes, synthetic camphor, and chemicals.

In order that the economic importance of the work to be undertaken by this station may be better understood it is necessary to

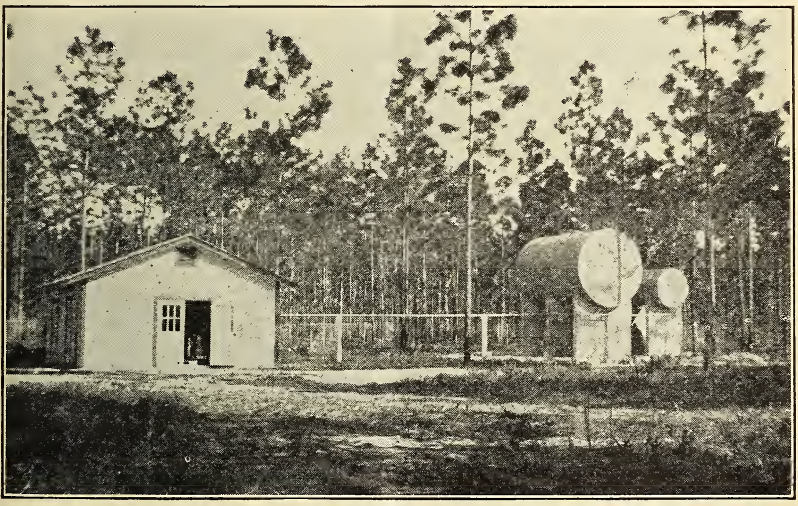

FIGURE 7.—Turpentine storage tanks and shed. Here turpentine will be packed in barrels and drums for delivery or for experimental tests, or stored in tanks for study.

consider some estimates of the losses that even today occur in naval stores production. These may be classified conveniently under the two general products of the industry, turpentine and rosin. It is conservatively estimated that one-fifth or more of the turpentine

contained in the gum as it comes from the tree is lost before it reaches the final user. Most of this loss occurs before the gum goes into the still, notwithstanding the efforts of the Forest Service, the Bureau of Chemistry and Soils, and others to reduce it. Even at 40 cents a gallon for turpentine the loss amounts to $2,000,000 annually. The worst of it is, the cost and labor of getting this turpentine out of the tree have been wasted. The producer has labored for less than nothing. The losses on rosin are no less startling. The gum as it drips out of the tree into the cup will almost invariably make X grade, or better, rosin. Now if we assume that there is an average difference of $2 per round barrel between the rosin that is made and what should be made with even reasonable care there is an estimated loss of $4,000,000, making a total of $6,000,000 lost each year by the producers through faulty methods, inadequate equipment, and unsuitable shipping containers. This does not include the loss of rosin caused by chips, trash, and dross, nor that due to leakage from faulty barrels, in storage, handling, and shipping.

This means an annual loss of $6,000,000 on a product worth about $40,000,000 on an average. Here in a word is the work confronting this naval stores station; it is to save the industry this tremendous loss, which occurs after the full cost of production has been incurred. If the station makes available to the producers means whereby but half this annual loss is prevented it will return to the people each year $100 for each dollar spent in operating it. The industry will get value received for every dollar spent.

The purpose of the naval stores station will be accomplished by the thorough scientific and practical study of the many factors that determine costs, wastes and losses, and damage to products. Among the problems on which the station is now working and on which it will work as soon as practicable are those listed below. All these problems cannot be handled at once, however; only a few can be studied at a time. Few of them can be solved in a single season's work. Work on a number of them will be in progress for possibly 3 to 5 years. Others will take even longer. A few, such as improved gluing of turpentine barrels, and the use of dehydrators, will show results at once, but even with these it may take several years to learn which procedures are the best and which yield the largest return to the producer.

Cups and gutters.—Cups and gutters that have the good qualities of the various kinds without their faults, rust-proof, frost-proof, fireproof, light, durable, reasonably priced, easily handled, and clean cups and gutters are needed.

Dipping and dipping tools.—Tools that are durable and do not damage the cup, and more definite knowledge of the details of dipping in terms of the yield and quality of turpentine and rosin are needed. A rosin vat is shown in figure 8.

Dip barrels—The losses that occur from uncovered dip barrels, both in handling and cleaning them and in the damage they do to rosin, must be accurately and exactly determined and methods of prevention developed.

Cup cleaning.—Dirty cups degrade rosin. A simple, economical method and equipment for cleaning cups will be developed.

Stills.—(Fig. 9.) Have we yet developed the best, most economical and most rapid type of fire still? This matter will be studied carefully by competent engineers, chemists, accountants, and naval stores

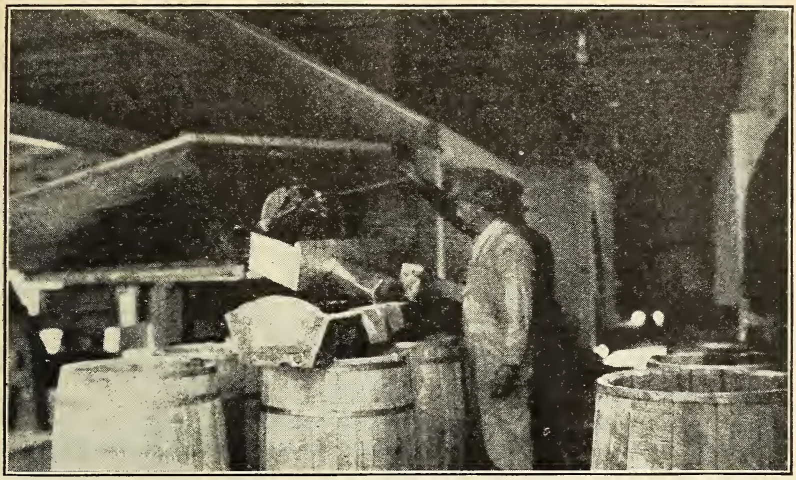

FIGURE 8.—This rosin vat is constructed on a hydraulic lift, to permit drawing rosin into barrels instead of dipping. Designed for stills located in a flat country.

men, after which we will know what more is needed, if anything, to give the industry the best still for its work.

Worm.—Is the industry using the most efficient and economical worm, one that condenses all the spirits? Again the trained and

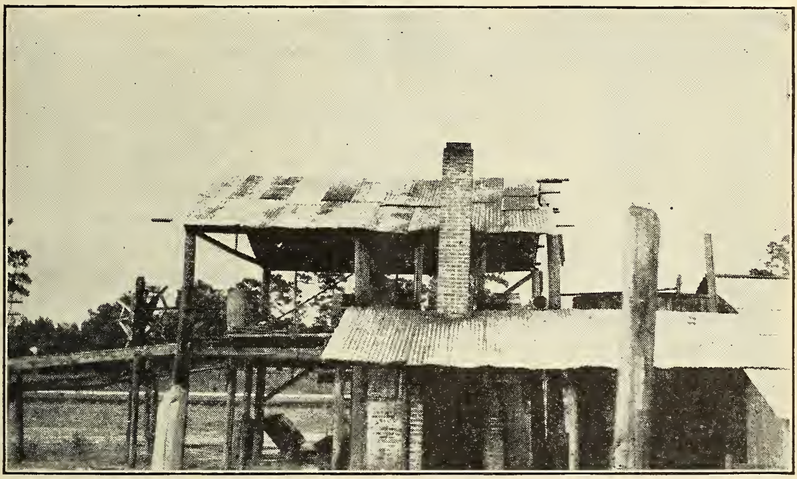

FIGURE 9.—Turpentine stills like this are in operation. As a rule they make the lowest grades of rosin, are inefficient and wasteful, and constitute a serious fire risk. The Bureau's work is largely to improve such stills and make them more efficient.

experienced station staff, which must include chemists and engineers, will work out the problems and give the answer.

Still operation.—The Bureau has consistently urged the use of an accurate recording thermometer on every still and has demonstrated

its value many times. Producers have gone a long way toward making high-grade rosin and recovering a larger yield of turpentine, but there are a dozen or more scientific problems in running a still that have never been solved. For instance, it is usually thought to be highly important not to go above the "danger" line on the chart in stilling, but we do not know about this. In fact, there may be something else of even more importance. Moreover, if it is found that the danger line must never be crossed we must find out why.

Water in turpentine.—Water in turpentine causes serious losses by dissolving glue from barrels, and iron and zinc from drums, tanks, and tank cars, and in discoloration and damage to turpentine. Perfectly clear spirits at the separator may contain enough water to cause serious losses through leakage, discoloration, and oxidation. The complete removal of water at the separator will solve half a dozen other problems. This will take careful scientific work on the part of the station's chemists and engineers. It will take time because the results must be proved by use.

Gum cleaning.—It is almost impossible to make a perfectly clean rosin by the processes now used in this country. This is possible only when clean water-free gum is available. The station will continue the studies of gum cleaning in order to determine whether this is practicable, and whether the rosin made from clean gum is better suited for use and will bring the producer more profit.

Chips and dross in rosin.—Producers are throwing away with every charge an average of 65 cents worth of rosin, on which all the expense of production has been incurred. Here, too, the station through accurate and reliable means must work out ways to prevent losses. Obviously the rational solution of this problem is to keep chips, trash, and dirt out of gum. This the Bureau consistently and constantly urges, realizing that it can be done only in part, that means to do it must be improved, and that some economical means for cleaning gum must be developed.

Straining.—The best straining of rosin today is very poor—the rosin contains more or less fine dirt, which lowers its grade and interferes with its use, resulting in dissatisfaction on the part of the user. The station will try to develop better strainers, and better and faster straining and batting, and above all to determine the causes for poor straining and the way in which all well-strained rosin can be made most economically (fig. 10).

There are dozens of other problems awaiting the station; there are several included in each one of those listed above, but the following two must be mentioned in order to present a well-rounded picture of the station's work.

Instruction.—How is the individual producer going to know what the station finds out? How is he going to adapt these findings to his own needs? How is he going to get part, at least, of that $100 return on each dollar the station is costing? What the station does, what it finds out, is utterly wasted if the producer does not use the facts that it ascertains. Informing the industry about its results will constitute a large part of the station staff's job. The station is, of necessity, a school as well as a research station. Producers are invited and expected to come here frequently that they may keep up with its work. They are invited to bring their stillers and managers

that they may see and understand any work that may be of service to them. They will receive instruction in still work; they will become acquainted with the best methods and equipment known; they will learn by observation and by doing. But the station goes further. The proper officers in each naval stores State, through contact with and first-hand knowledge of the work of the station, will provide the operators of individual stills with knowledge about the practices and equipment developed, worked out, and proved at the experiment station.

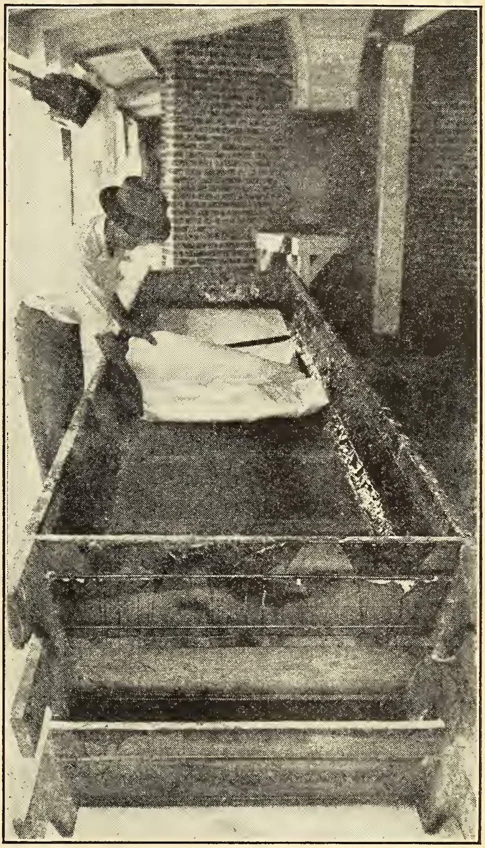

FIGURE 10.—Placing cotton batting on the bottom strainer must be done correctly if well-strained rosin is to be made.

User's problems.—The user has many turpentine and rosin problems and in these too the producer is vitally concerned. In solving these problems the station will be serving producers. The user's problems must be solved in order that he will continue to demand these products in increasing quantities, and that he will not be induced to use substitutes. It is only because there is a demand for these products that they can be sold at all. Helping supply the user's needs most fully is going to be of great value to each producer.

The solution of some of the producer's problems will, of course, eliminate some of the user's problems. Getting all the water out of turpentine and the iron out of rosin, and providing better rosin packages, and better rosin grading, for example, will help the user. But the user has his individual industrial problems. He wants turpentine and rosin that are better suited to his specific needs, and he is willing to pay more for such naval stores. The camphor maker wants a turpentine with certain definite characteristics. The varnish maker wants, in some cases, a quick-drying turpentine, or a rosin that will not deteriorate in color during processing. The soapmaker also wants such rosin. The electric-cable maker wants rosin free from water and with a more definite melting point. Others want rosin free from copper. The station hopes and expects to learn how the industry can supply these needs, that the producer

may profit more and that the user may make his finished products of better quality and at lower costs.

The naval stores station is not the usual turpentine still. It is much more. The best, most costly turpentine still in the country has neither the buildings, equipment, nor staff to carry on the scientific research work that will be undertaken here. The mere recording of experiments and tests will take the time of two capable persons. Only the forest experiment stations and the naval stores station can give the correct and reliable answers to the industry's problems. These answers can be given only after hours and hours of careful planning, trial, and proof by a competent and adequate staff of chemists, engineers, accountants, and experienced naval stores stillers and laborers. Many pieces of equipment may be designed, built, and thrown on the junk pile, and many processes developed and discarded before the correct answers to some of these problems are obtained.

## WHAT THE BUREAU OF CHEMISTRY AND SOILS HAS DONE ON NAVAL STORES

Some of the accomplishments of the Bureau of Chemistry and Soils in its work on naval stores are listed below.

Developed permanent rosin standards.

Developed a fire still that heats evenly, draws well, and saves fuel. The highest grades of rosin that can be made from normal gum collected as long recommended by the United States Forest Service can be produced with this still.

Demonstrated that the use of a thermometer on a still pays the producer in better grades of rosin.

Demonstrated that the use of a graduated bottle pays dividends in more turpentine and better rosin.

Showed that a small amount of rust in the gum may lower the rosin 3 or 4 grades.

Proved that turpentine may be stored 2 years or more under proper conditions without material change.

Developed a good rosin-sampling mold.

Designed, built, and proved out the best type of steam still now known for American conditions.

Developed for the industry reliable annual statistics on consumption of naval stores.

Through cooperation with State organizations, made available to the producer, at his own still, the best naval stores still practices, thus helping to make better rosin, save turpentine already made, and reduce waste.

## THE PROGRAM OF THE STATION

The program of the station includes work on:

Gum cleaning.
Improved processes and equipment.
Turpentine cups and gutters.
Dipping and dipping tools.
Better rosin straining.
Better turpentine separators.
Getting water out of turpentine.
Better dip barrels.
Losses from uncovered dip barrels.
A better rosin package.
Turpentine storage and shipping.
Saving the rosin in chips and dross.

- Producers' stilling problems.
- Instruction in running turpentine still.
- Gluing turpentine barrels.
- Better coatings for turpentine drums.
- Cup cleaning.
- Better methods of sampling rosin.
- Rosin for special purposes.
- Turpentine for special purposes.
- Instruction in still setting.

Those interested in turpentine and rosin production and use are invited to bring any problem they think should be studied to the attention of the Bureau of Chemistry and Soils in Washington, D.C., or directly to the naval stores station, Lake City, Fla.

The station is on the Osceola National Forest, Old Spanish Trail, 12 miles east of Lake City, Fla. It can be reached over good roads from any point in the turpentine belt.

Experimental work on pine-gum production is also done here on the Osceola National Forest by the Southern Forest Experiment Station, United States Forest Service.

The Florida Forest Service is cooperating with the Bureau of Chemistry and Soils and carries direct to Florida producers the best naval stores practices.

The work of the Forest Service and of the Bureau of Chemistry and Soils may be inspected on the one trip to the station.

The station staff consists of George P. Shingler, acting chief; E. L. Patton, chemical engineer; Charles K. Clark, assistant chemist; Guy M. Ferguson, accountant; G. M. Cory, clerk; N. C. McConnell, stiller; experienced, reliable turpentine laborers; C. H. Coulter, Florida cooperative agent, Lake City, Fla.; and K. S. Trowbridge, Georgia cooperative agent, Tifton, Ga.

U.S. GOVERNMENT PRINTING OFFICE: 1934

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